

# SmartFuel® hydrogen supply options

## Complete flexibility for your clean energy applications



Air Products' goal is to deliver the most cost-effective hydrogen to our customers while maintaining the highest levels of safety and reliability.

### How do we do that?

- Numerous production sites in North America to enable product supply throughout the region
- Multiple supply options, including gaseous and liquid delivery, pipeline, plus on-site generation when beneficial to the customer
- One of the largest privately owned trucking fleets in the industry with dedicated drivers delivering 24 hours a day/365 days a year
- 99.95 percent on-time delivery record for our bulk gas products
- Customer service organization responsive 24 hours a day/365 days a year
- Centralized scheduling, proprietary logistics software and remote TELALERT telemetry services
- Unmatched capability to provide backup hydrogen to fueling stations



Hydrogen is an attractive alternative to fossil fuels and is used in a wide range of transportation and power generation applications. As the world's largest supplier of merchant hydrogen and a leader in hydrogen fuel infrastructure, Air Products brings safe, reliable and cost-effective hydrogen to the marketplace.

Hydrogen can be supplied to customers in a variety of ways, including production at the point of use. Air Products offers a comprehensive set of supply options to meet the needs of each customer. The best supply option is based on a variety of factors, including use location, purity and volume. Our experienced engineers can work with you to determine the best source of supply for your application and location and help take the guesswork out of your decision.

You can count on Air Products to reliably deliver hydrogen to your fueling station in order to meet the needs of your fleet or customers. From the reliability of our standard delivery fleet, to the convenience of our SmartFuel mobile hydrogen fueling stations and the responsiveness of our SmartFuel microbulk and dual phase hydrogen trailers, we'll get you the hydrogen you need—how you need it and when you need it.

## Standard modes of supply

Air Products supplies hydrogen as a liquid or gas throughout North America. Liquid hydrogen is the primary mode of supply for fueling station applications requiring greater than 25kg/day and is delivered in trucks and stored in cryogenic tanks at the point of use. Gaseous hydrogen is delivered in pipelines, tube trailers or cylinders. Pipelines

are typically used to supply hydrogen to large refineries and petrochemical companies. Our tube trailers can either deliver to storage vessels at your site or remain at the site and be replaced when the inventory of the product in the trailer is low.

### Liquid hydrogen trailer



- Liquid hydrogen
- Up to 4,000 kg/trailer
- Liquid hydrogen is primary mode of supply for customers requiring greater than 25 kg/day

### Gaseous hydrogen tube trailers



- Gaseous hydrogen
- 2,400 psig
- 142–300 kg/trailer
- Can be left on-site or used to fill other storage vessels

## Air Products' unique modes of supply

Not every customer is the same. In response to the unique needs of the hydrogen fueling market and our customers, Air Products has developed and invested in a number of new hydrogen delivery technologies. These include the

ability to deliver gaseous hydrogen at pressures in excess of 6,600 psig, plus our SmartFuel mobile hydrogen fueling stations and SmartFuel microbulk truck for lower quantity deliveries.

### Air Products has the unique ability to supply hydrogen in various situations:

Air Products can provide hydrogen directly to high pressure storage tubes at a fueling station for supply when the primary supply has been interrupted or the station is being maintained. Having a high pressure source of hydrogen is one key to ensuring high on-stream rates for fueling stations and customer up time. And, we can supply during these times without impacting the availability of hydrogen at the fueling station dispensers.

We can also supply hydrogen to vehicles during the construction of permanent fueling stations and to support short-term demonstrations that require dispensed hydrogen. Do you have a location that's difficult to access such as a telecommunications tower? No problem. We can handle that, too.

### Gaseous hydrogen tube trailers



- Gaseous hydrogen
- 6,600 psig
- 200 kg/trailer
- Can be left on-site or used to fill other storage vessels
- Can be used for back-up at existing fueling stations

### SmartFuel mobile hydrogen fueler



- Gaseous hydrogen
- 6,600 psig
- 60–150 kg
- Automated fill procedure
- Requires no utility hookups
- Integrated dispensing system
- Can be used to fuel vehicles directly or refill high-pressure storage tubes on-site

### SmartFuel microbulk truck



- Gaseous hydrogen
- 7,500 psig
- Easy maneuverability
- Used to deliver small quantities of hydrogen to cell tower applications
- Can be used for backup at existing fueling stations
- Multiple nozzles supply up to four different delivery pressures

### SmartFuel dual phase hydrogen tanker



- Liquid/gaseous hydrogen
- Multiple delivery pressures
- Up to 7,200 psig gaseous hydrogen
- Can be left on-site or used to fill other storage vessels

## On-site hydrogen generation options

Interested in on-site hydrogen production? Our engineers will help you compare the costs and benefits of delivered hydrogen to producing it at your location. Our leadership in hydrogen generation through natural gas reformation along with our decades-long experience with electrolysis means you can rely on Air Products to supply the on-site production options that suit your needs. Whether we provide the gas under an on-site agreement or you purchase the equipment, you'll join customers in over 40 countries who count on Air Products for flexible gas generation options, convenience, operational excellence and long-term savings.

### Air Products PRISM® hydrogen generator



- Gaseous hydrogen
- Steam methane reformer (SMR)
- 200–500 kg/day
- Purity levels 99.999% or better
- Compact, modular design



### Hydrogen electrolyzer



- Gaseous hydrogen
- Proton exchange membrane (PEM) or potassium hydroxide (KOH) technology
- Various quantities/day
- Purity levels 99.9995%

## SmartFuel hydrogen storage options

In addition to flexible supply, Air Products offers a range of storage options, including our SmartFuel hydrogen storage modules. These modules are used to inventory relatively small quantities of hydrogen where cylinders are traditionally used. They are refilled in place with Air Products' SmartFuel microbulk truck, eliminating cumbersome cylinder change-outs.

### Liquid hydrogen storage tanks



- Liquid hydrogen
- 1,500–25,000 gals
- Horizontal or vertical orientation for flexible installation

### Hydril storage tubes



- Gaseous hydrogen
- 2,400–7,777 psig
- Fill-in-place design
- Various quantities based on number of tubes
- 25–30 ft. tubes

### SmartFuel 8-cylinder hydrogen storage module



- Gaseous hydrogen
- 3,000 psig
- 9.5 kg
- 36 hours of backup power at 3.5 kW load
- Compact (28 in. x 56 in. x 72 in)
- Fill-in-place design eliminates cylinder change-out, increasing safety and quality control

### SmartFuel 16-cylinder hydrogen storage module



- Gaseous hydrogen
- 3,000 psig
- 19 kg
- 72 hours of backup power at 3.5 kW load
- Compact (52 in. x 56 in. x 72 in)
- Fill-in-place design eliminates cylinder change-out, increasing safety and quality control

## About Air Products

With more than 50 years of hydrogen experience, Air Products is at the forefront of hydrogen energy technology development. The company has an extensive patent portfolio in hydrogen dispensing technology.

Air Products has also placed over 150 hydrogen fueling stations worldwide. Cars, trucks, vans, buses, scooters, forklifts, locomotives, planes, cell towers, material handling equipment and even submarines have been fueled with trend-setting technologies that involve Air Products' know-how, equipment and hydrogen. Use of the company's technology is increasing and is currently over 500,000 hydrogen fills per year.

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